Small Business Innovation Research/Small Business Tech Transfer

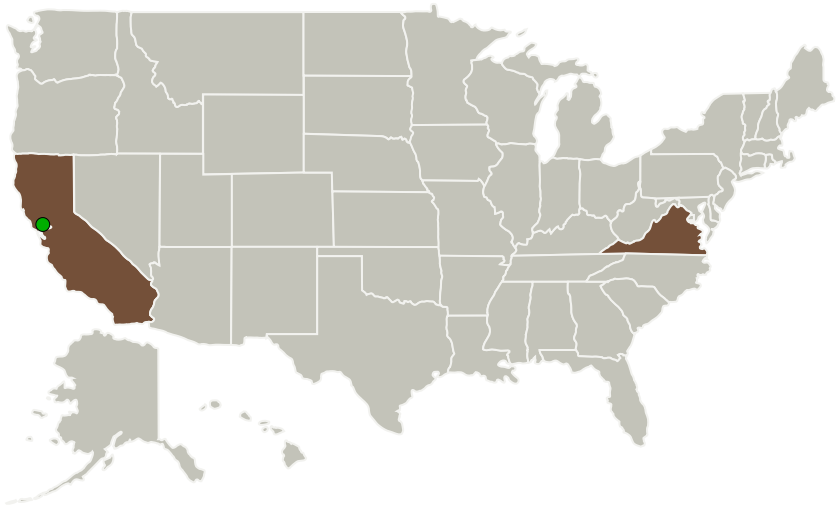
Flexible, High Char Yield Hybridsil Adhesive Materials for Next Generation Ablative Thermal Protecti, Phase II

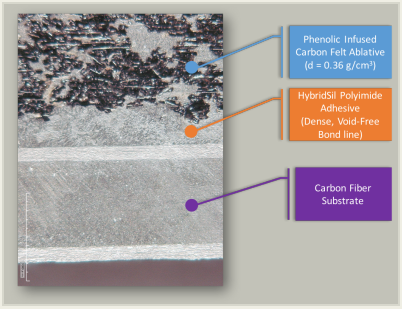
Completed Technology Project (2017 - 2019)

Project Introduction

A Phase II SBIR transition of NanoSonic's HybridSil poly(imide siloxane) ablative adhesive technology will provide a pivotal funding bridge toward its Phase III integration within next-generation EDL thermal protection materials. Based on highly encouraging Phase I results indicating HybridSil poly(imide siloxane) adhesives afford an increase in adhesive strength up to 659% to phenolic thermosets and 756% to cyanate thermosets when tested at 125 C while also integrating low Tg (-98 C) polysiloxane domains necessary for desirable low temperature flexibility and impact resistance, NanoSonic envisions significant Phase III transition potential into next-generation aeroshell designs. During the proposed Phase II effort, NanoSonic will rigorously optimize the high temperature adhesive strength of HybridSil poly(imide siloxane) adhesives to a broader spectrum of aeroshell materials up to 400 C, supply promising adhesives to team partner Lockheed Martin Space Systems for construction and mechanical testing of prototype ablative thermal protective samples, complete a comprehensive analysis of the physical and mechanical properties of down-selected adhesives properties for TPS design engineers, and transition Phase II optimized adhesive resins to 55-gallon batch manufacturing quantities for distribution to NASA and Lockheed Martin groups. Upon completion of the Phase II program, NanoSonic's high temperature HybridSil adhesives will facilitate future reductions in total aeroshell mass for increased payload opportunities by enabling the use less adhesive and reduced thickness TPS.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Nanosonic, Inc.	Lead Organization	Industry	Pembroke, Virginia
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Virginia

Project Transitions

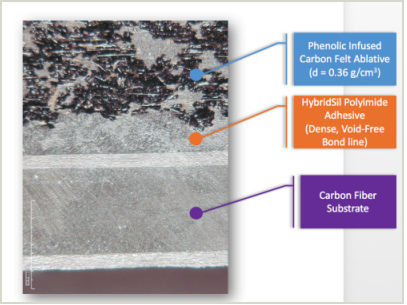
April 2017: Project Start

August 2019: Closed out

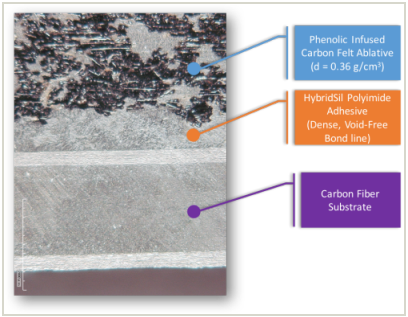
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/141077)*

Images



Briefing Chart Image
Flexible, High Char Yield Hybridsil Adhesive Materials for Next Generation Ablative Thermal Protecti, Phase II Briefing Chart Image
(https://techport.nasa.gov/image/128261)



Final Summary Chart Image
Flexible, High Char Yield Hybridsil Adhesive Materials for Next Generation Ablative Thermal Protecti, Phase II
(https://techport.nasa.gov/image/137012)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Nanosonic, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

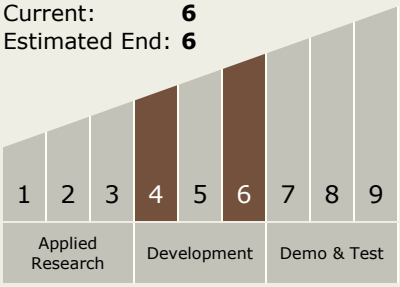
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Victor V Baranauskas

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



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Completed Technology Project (2017 - 2019)

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.3 Thermal Protection Components and Systems
    - TX14.3.1 Thermal Protection Materials

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System